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ARTICLES ON VISIT OF CHINESE SCIENTISTS TO USSR, CURRENT CHINESE SCIENCE

[Comment: This report presents a Soviet article describing the visit of Chinese scientists to the USSR, and four articles by well-known Chinese scientists on the current position of the physical, geological, mathematical, and chemical sciences in China.

An index of the Chinese scientists mentioned in this report is appended.]

VISIT OF CHINESE SCIENTISTS TO USSR

Vestnik Akademii Nauk SSSR, No 6, 1953, pages 50-53

At the invitation of the Academy of Sciences USSR, a large group of Chinese scientists, headed by Prof Ch'ien San-ch'iang, director of the Institute of Modern Physics of the Academia Sinica, visited the Soviet Union. The group included noted scientists whose works are well known to Soviet scientists and representatives of the younger generation of scientific workers who have completed their education under the people's government.

The scientists in the delegation represented various fields of science: physics, mathematics, geophysics, botany, physiology, electrical engineering, architecture, history, geology, etc. All are united in their effort to raise the level of science in China, so that the practical problems of economic and cultural life in the new China may be solved.

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The purpose of the visit of the Chinese scientists was to familiarize them with the activity of the Academy of Sciences USSR and its institutes, and of other scientific research institutions of the Soviet Union.

Guided by the appeal of Mao Tse-tung to master the theory of Marxism-Leninism and to study the progressive experience of Soviet science and technology, the Chinese scientists took a lively interest in the scientific and cultural life of the USSR during their 3-month stay. In Moscow and Leningrad alone, they visited about 100 scientific establishments of the Academy of Sciences USSR and of various ministries and departments, including the Academy of Medical Sciences USSR, the All-Union Academy of Agricultural Sciences imeni V. I. Lenin, the Academy of Architecture USSR, the Agricultural Academy imeni K. A. Timiryazev, the Academy of Social Sciences under the Central Committee of the CPSU, the Ministry of Culture USSR, the Ministry of Health USSR, and a number of universities and institutes.

During their visits to scientific institutions, the Chinese scientists became familiar with the basic aims of Soviet scientific research work, the organizational structure and planning of work in these institutions, and the problems of training scientific personnel and raising their ideological level.

In addition, discussions of scientific and organizational problems were arranged for the Chinese scientists in the Presidium of the Academy of Sciences USSR. The guests became thoroughly familiar with the structure of the presidium, the work of the Council for the Study of Productive Forces, the publishing houses, the system of training scientists in postgraduate courses, and other phases of the academy's work. These studies may have great importance for the organization of scientific research and the successful development of science in China.

In the course of these discussions, which sometimes lasted several hours, the Chinese scientists asked all kinds of questions, showing an interest in every phase of activity of the academy. They were especially interested in the coordination of scientific research work with the requirements of industry and agriculture, the effect of the decisions of the 19th Congress of the CPSU on plans for scientific research by the Academy of Sciences USSR, the procedure for preparing the academy's 5-year and annual plans, the organization and conduct of scientific discussions, and methods of raising the ideological and political level of scientific workers. The questions asked were proof of the lively interest of the Chinese in the organization of scientific research in the Soviet Union and also of their desire to establish a closer connection between science and the practical demands of construction and development now taking place in all branches of the national economy of China.

The most noted scientists of the USSR took part in the discussions with the Chinese scientists. The included Academician A. N. Nesmeyanov, President of the Academy of Sciences USSR; Academicians I. P. Bardin and V. P. Volgin, vice-presidents; Academician A. V. Topchiyev, chief scientific secretary of the presidium; Academician N. N. Anichkov, President of the Academy of Medical Sciences USSR; Academician T. D. Lysenko, President of the All-Union Academy of Agricultural Sciences imeni V. I. Lenin; Academician A. V. Palladin, President of the Academy of Sciences Ukrainian SSR; T. Z. Zakhidov, President of the Academy of Sciences Uzbek SSR; the scientific secretaries of departments of the Academy of Sciences USSR; scientific secretaries of the Presidium of the Academy of Sciences USSR; and directors and scientific associates of institutes.

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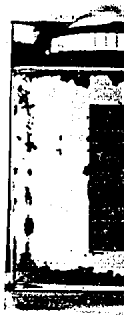

Soviet scientists enumerated Soviet achievements in various fields of science and technology, and told of the close cooperation between workers of science and industry, the introduction of the results of scientific research in the practical work of the nation's economy, and the organization of control over the fulfillment of scientific research work.

To give the Chinese scientists fuller acquaintance with the activity of the academy, individual members of the delegation were invited to attend meetings for the defense of dissertations on subjects of possible interest to them, and conferences of the Scientific Secretariat and the Presidium of the Academy of Sciences USSR. At one of these conferences, the delegates heard a report by A. P. Vinogradov, Corresponding Member of the Academy of Sciences USSR, on the work of the Institute of Geochemistry imeni V. I. Vernadskiy, and a report by A. A. Mikhaylov, Corresponding Member of the Academy of Sciences USSR, on the construction of the Pulkovo Observatory.

At a meeting of the presidium of the academy, the guests heard a report by S. P. Tolstov, Doctor of Historical Sciences, head of the Khorezm Archeological Expedition, and other reports on a number of general organizational problems.

At their request, the delegates were given an opportunity to study the development of science and culture in the union republics. During their 10-day stay in the Ukrainian SSR and the Uzbek SSR, they visited not only the Academies of Sciences and many scientific establishments, but also plants, factories, mines, kolkhozes, and sovkhozes. They were able to observe how the acievements of science were practically applied in industry and agriculture. The Chinese scientists published articles in Soviet newspapers and periodicals, and gave radio talks about their impressions of the cooperation between science and production and of the utilization of the results of Michurin biology in agriculture. Much interest was shown by the delegates during their visit to Stalino, where they inspected a coal mine and witnessed improved methods of coal mining and the operation of a coal-mining combine.

After the return of the delegation to China, the President of the Academy of Sciences USSR received a telegram from Peiping in which Li Ssu-kuang, Vice-President of the Academia Sinica, expressed his thanks for the friendly reception and assistance which had been given. The telegram stated that, during its stay in the USSR, the delegation had gained much valuable knowledge, which would not only further the development of science in China, but also strengthen the friendship between the two Academies of Sciences.

SHORT HISTORY OF PHYSICS IN CHINA

Vestnik Akademii Nauk SSSR,
No 5, 1953, pages 17-27

Ch'ien San-ch'iang,
Dir, Inst of Modern Physics,
Academia Sinica

The development of modern physics in China, as of other natural sciences, was begun by scientists who had received their education in capitalist countries. Ths history of modern physics in China dates back slightly over 30 years; departments of physics were established in higher educational institutions only after 1914, and scientific research work has gradually developed since 1926.

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In the Tsinghua University, research was done under the supervision of Yeh Ch'i-sun and Wu Yu-hsun on X-rays, electronics, and nuclear and theoretical physics. At Peking University, experimental and theoretical work on spectrography was [illegible]ed by Yao Yui-t'ai. At the Institute of Physics of Peking University, Yen Ch'i-tz'u was in charge of research on spectrography, piezoelectric crystals, applied optics, radiochemistry, and crystallography. At the Institute of Physics of the Central Academy, Ting Hsi-lin supervised research work on radiotechnology, magnetism, geomagnetic measurements, and the manufacture of instruments for physical research.

In the universities (e.g., Chekiang University), attention was also given to the development of physical research.

Under the former economic and political conditions, physics, like other sciences in China, was slow in developing. The reactionaries were not interested in the development of scientific research, and universities and scientific research institutes received no serious support from the government. Therefore, physicists had to make tremendous efforts to overcome all kinds of difficulties. For example, the only printed publication on physical problems, the Journal of Chinese Physics, was unable to appear regularly because of constant financial difficulties.

During the 1930s and 1940s, when the Japanese imperialists attacked China, they destroyed a large part of the equipment necessary for research, making it impossible to continue. [illegible]esearch physicists saved a small amount of instruments and literature and moved to the distant southwest and northwest parts of China, establishing primitive laboratories. After the expulsion of the aggressors, the scientists returned to Peiping, Nanking, Shanghai, and other large cities. The position of science did not improve, however, until the establishment of the people's government.

According to incomplete data for the 30 years preceding the victory of the Chinese people, scientists published a total of about 1,400 articles on the various branches of physics. Works in the fields of atomic and molecular physics began to be published after 1914 and over 100 articles dealt with problems in these fields. Among the first of these works is the research of Li Yao-pang on the measurement of the electric charge of electrons, Hu Kang-fu on the measurement of the maximum speed of photoelectrons originating from X rays, Yeh Ch'i-sun on the measurement of the Planck constant, Wu Yu-hsun on the study of the dispersion of X rays in gases, and others. The last work deserves special attention, for the results of the study on the distribution of intensity of the shifted and unshifted lines in the Compton effect were of great importance for the determination of this effect.

About 250 articles dealt with problems of nuclear physics and research on cosmic rays. The first work in these fields appeared about 1930. The most important studies were those on gamma rays by Ch'ao Ch'ung-yao, who was the first to discover the anomalous line of radiation of the atomic nucleus and to determine its wave length. This is the special radiation which we now know occurs in the conversion of a pair of electrons into a photon. Wang Kan-ch'ang suggested a method of detecting a neutrino. Ch'ien San-ch'iang made a study of gamma rays and their intensity in the region of low energies.

The most important work in the field of nuclear reactions was that done by Ch'ien San-ch'iang and Ho Tse-hui. These scientists were the first to discover the phenomenon of fission of the uranium nucleus into three or four parts, and they gave a basic explanation for the phenomenon of fission into three fragments. The research of Chang Wen-yu on the disintegration of light nuclei and of Chao Ch'ung-yao on the nuclear reactions of fluorine made it possible to measure

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certain energy levels of light nuclei. In his study of cosmic rays, Chang Wen-yu did research on gamma rays originating from mu-mesons in lead and iron, and Wang Kan-ch'ang studied the energy spectrum of electrons, resulting from the decay of mu-mesons.

The first studies on theoretical physics (of which about 200 have been published) appeared about 1926. To be noted among these studies are those of Wang Ch'u-hsi and Chang Ts'ung-su, who applied the methods of statistical mechanics to their research on crystalline alloys. After 1940, the number of research studies on quantum mechanics increased, especially on the theory of the meson field. Peng Huan-wu, using the theory of attenuation, explained certain phenomena occurring in cosmic rays; this explanation, in turn, made it possible to examine certain problems in connection with the hard component of cosmic rays. Ma Hsi-ts'un studied the dispersion of mesons, and Hu Ning, using the meson theory, obtained relativistic corrections for nuclear forces. Peng Huan-wu also introduced a new field theory and Chang Ts'ung-su made a number of research studies on the quantum field.

In 1928, articles on problems of spectroscopy and optics began to be published; about 300 have been devoted to discussing research in these fields. Yen Ch'i-tz'u and other physicists made systematic studies of the resolution and shift of spectrum lines in an electric field, as well as of the widening, shift, and asymmetry of atomic spectra of alkali metals.

Systematic research on molecular spectra was carried out by Yao Yui-t'ai, Wu Ta-yu, Ch'eng Hua-ch'i, and others on Raman spectra (spectra of combined scattering) and by Wu Hsueh-chou and Lu Ta-kang on absorption spectra. Wu Ta-yu did extensive research, both experimental and theoretical, on the oscillatory spectra of polyatomic molecules; this research was generalized in his book Oscillatory Spectra and Structure of Polyatomic Molecules. Ch'eng Mai-lan conducted a number of studies, using spectroscopy to examine astrophysical and atmospheric phenomena.

In the field of applied optics, the most attention was devoted to the manufacture of glass. Wang Ta-heng carried out systematic spectrophotometric research on the effects of iron, uranium, and antimony in sodium glass.

About 170 published works concern the physics of solids, the first being published about 1926. Special mention should be made of the systematic research of Ko T'ing-su with regard to the phenomenon of internal friction in metals. The viscosity of metal granules was proved with the help of this research, making it possible to explain many dynamic properties of metals. Ch'ien Lin-chao worked on the solution of problems of the sliding of metallic body-centered single-crystals and Shih Ju-wei studied the magnetic properties of alloys and compounds. In examining the structure of crystals, Yu Jui-huang developed a new complex method of X-ray analysis. In the field of instrument building, mention should be made of the work of Ts'ai Po-ling, who made computations for the production of large electromagnets and natural permanent magnets. In the field of the theory of solids, the work of Huang K'un, on the theory of the R-center and the ionic lattice, deserves special interest. Huang K'un has recently turned to an examination of the theory of crystals.

Of 180 works on electronics and electromagnetism, the systematic observations of piezocrystals by Yen Ch'i-tzu and Ch'ien Lin-chao, as well as the work of Min Nai-ta on the study of electrical distribution circuits, deserve attention.

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Research in the field of mechanics developed only after 1935. Basic contributions have been made to aerodynamics and the mechanics of elastic bodies.

Research on the theory of turbulence has been done under the supervision of Chou P'ei-yuan, who has also solved the problem of velocity correlation and has obtained basic results in the solution of several practical questions. Ch'ien Sui-sen has studied the theory of the similarity of fields with subsonic speeds; the results of his research have practical importance in the solution of problems concerning airplane wings. Lin Ch'ia-ch'ao achieved positive results in his research on the stability of laminar flow and thus put an end to arguments which had been going on for several decades.

In the field of the mechanics of elastic bodies, mention should be made first of the work of Ch'ien Sui-seng on the nonlinear theory of stability of thin membranes, which resulted in the creation of a new field in stability problems. The generalizing studies of Ch'ien Wei-ch'ang on the theory of thin plates and shells unified this theory and showed a new direction for the solution of problems in the field of mechanics of nonlinear elastic bodies, i.e., the problem of terminal deflections. The first studies on the principles of the theory of solids were completed by Lu Ho-fu.

It is evident from the above that the basis of physical research in China is very weak, the history of physics is comparatively short, its development has been irregular, and the number of works is small.

Because China was for a long period a backward, semicolonial country, most of her scientists studied in the capitalist countries of Europe and America. These scientists pursued the study of "international physical problems" and their work was therefore alien to the life of the people. The reactionary rulers of China neglected scientific research work: not only was there a lack of the most essential equipment and materials, but the lives of scientific workers were constantly in danger. Physical research was done in a haphazard fashion, without any plan or purpose, by individuals who rarely cooperated and never planned a distribution of work. The results of this can be felt even now, for there is still a tendency to give preference to theoretical rather than experimental work and to prefer experimental work to research with a practical purpose. It should also be noted that there are still comparatively few complex and large instruments in China. Those branches of science closely related to the life of the people, such as radio and hydrodynamics, are poorly developed. In theoretical fields, idealistic influences have been insufficiently overcome.

With the establishment of the people's government, physics in China began a new stage of development, and more attention was given to science. An Institute of Modern Physics and an Institute of Applied Physics have been organized under the Academia Sinica. Obstacles to the development of physical research, such as insufficient funds or indifference to the needs of science, have been eliminated, but the rate of economic construction is still considerably higher than the development of physical science.

Because of the extreme weakness of the experimental base for physical research, especially during the initial period when the physics institutes were being created, it was necessary to concentrate on the fulfillment of the most important experimental work. Even here, however, the results obtained are still very limited.

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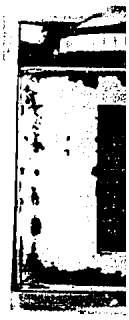

The work of the Institute of Modern Physics includes the following fields: theoretical physics, nuclear physics, cosmic rays, and radiochemistry. The research on nuclear physics is basic. During the last 3 years, preparations for experimental work have been made. A number of research studies on theoretical physics have been made, concerning the ability of light nuclei to fuse. The study of the forces of interaction among nuclei has begun.

The basic task of the Institute of Applied Physics is the study of the structure and properties of matter and its change under different conditions, with a view to applying the results obtained to production technology. At present, research is concentrated on the physics of solids. In addition to the continuing work on crystallography, magnetism, optics etc., research has been begun on semiconductors and low temperatures.

The Academia Sinica has founded an instrument-building workshop, the main task of which will be the planning and manufacturing of optical instruments and other precision instruments required by industry. At the same time, preparations are being made for the organization of an institute of economics.

Physical research, which in the past began in various higher educational establishments, will be developed extensively in the future. Higher educational establishments are now reorganizing their system of instruction, studying Soviet methods and curriculums, and improving the old methods. Plans have been made to organize research departments in higher educational establishments.

A number of social reorganizations, carried out under the leadership of the Chinese Communist Party in the past 3 years, have been especially concerned with the ideological re-education of scientists, and have created a sound ideological basis for future work in the field of physics.

We hope that the aid and authoritative instruction of Soviet scientists will further the speedy and extensive development of Chinese science according to the pattern of Soviet science, so that research may be closely integrated with the needs of the state and with the struggle for strengthening the forces of peace.

GEOLOGICAL SCIENCE IN CHINA

Vestnik Akademii Nauk SSSR,
No 5, 1955, pages 22-27

Hou Te-feng, Dir, and Chang Weng-yu, Dep Dir,
Inst of Geology, Academia Sinica

The first geological organization in China was formed in 1911, when the temporary government in Nanking created a department of geology in the Bureau of Mining of the Ministry of Industry. A short-term school was opened under the direction of the geologist Chang Hung-jao and a small number of geologists were trained in this school. In 1916, the Chinese Geological Service was established and geological research began; the Institute of Geology was founded in 1928.

During the /anti-/ Japanese war, the Bureau of Prospecting and Surveying of Useful Minerals was organized. During the period 1927-1947, local establishments for geological research and prospecting were organized, one after the other, in the provinces of Honan, Hunan, Kwangtung, Kwangsi, Kweichow, Szechwan, Fukien, Yunnan, Sinkiang, and Chekiang, and in northeast and northwest China. With the help of these establishments, studies on stratigraphy, paleontology, geological structure, and deposits of useful minerals were carried out. The results of the work were published in geological monographs, books, and periodical articles.

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In the old China, geological research and the study of useful minerals served only the interest of imperialism and bureaucratic capitalism, and the Chinese people did not understand its value. It was natural that, under such conditions, Chinese geologists should be concerned mainly with purely theoretical research, especially with problems of stratigraphy and paleontology. The works of Soviet paleontologists helped Chinese scientists to define more accurately the stratigraphic subdivisions of different strata. For example, the fossils found in 1925 by Prof Li Ssu-kuang, under the supervision of [redacted] A. A. Bolkhovitnova, in the region of the Podol'sk quarry, assisted Chinese geologists in solving the problem of the Middle Carboniferous period. As a result, geologists also solved the long-disputed problem concerning the period of formation of the T'ai-yuan strata and the Maning not further identified limestones.

Between 1929 and 1935, Chinese geologists carried out research on a nation-wide scale. Basic work was done in the provinces of Shensi, Szechwan, Suiyuan, Yunnan, Kweichow, Sikang, Kansu, Jehol, Hupeh, Hunan, Kiangsi, Kwangtung, and Kwangsi. Detailed, systematic research was carried out in the region of the Ning-ch'en range near Nanking. In 1929, Pei Pan-cheng found the remains of Sinanthropus Pekinensis and stone tools of production in Ch'ou-K'ou-tien, one of the worlds richest sources of traces of prehistoric man. The study of materials found there has contributed greatly to the science of anthropology.

In the field of paleontology and stratigraphy, the research of Yang Chung-chien on fossil rodents in northern China, as well as on fossil vertebrates and tertiary deposits, should be mentioned; as should the work of Sun Yun-chu on Trilobita and the stratigraphy of the Lower Paleozoic era, that of Huang Ch'i-ts'en on stratigraphy and Permian deposits, that of Yu Ch'ien-chang on Carboniferous deposits, that of T'ien Ch'i-ch'un and Yin Ch'iang-ts'un on Devonian deposits, that of Hsueh Ts'e on the graptolites of the lower Yangtze valley, and that of Ch'en Hsueh on the fusilina of southern China.

In the field of mineralogy, petrography, and the study of deposits of useful minerals, the most important research was on the effusives of the Upper Mesozoic era in the region of Hsuan-hua, the systematic investigation of volcanic rocks of the Ning-ch'en mountain range near Nanking, and the study of granites and contact metamorphism in rocks composing the Hsi-shan range near Peiping. During the same period, work in the field of petrography was begun. In 1935, Ho Ts'o-ling discovered rare earth minerals in the Suiyuan Province; these minerals served as the basis for the use of spectral analysis in the study of minerals in China. Considerable work on the study of ore deposits and metallogeny was done by Hsieh Chia-jung and Meng Sun-ming.

As a result of research in the field of Quaternary geology by Li Ssu-kuang, it was established that glacial periods existed in the regions of Lu Shan, Huang Shan, western Hupeh, and Kweichow. The work of Li Ssu-kuang on glacial and fluviological deposits opened new ways for the study of Quaternary geology and disproved the erroneous opinions of bourgeois geologists (such as Richtofen, Anderson, and others).

Since 1927, Chinese geologists have begun to study the tectonic movements of the earth's crust. It was first of all determined that the chief orogenesis of the Mesozoic period in China corresponds to the Yon-shan movements. In southern China, the Kwangsi movements were discovered to correspond to the Caledonian folding phase. Different phases of the Hercynian movement in regions of southeast China were studied in detail and were subdivided according to period. It was established that the Hercynian movements had a strong influence on the mountain area of western China. The importance of the Himalayan movements was gradually established and it was proved that the pre-Hsi-ling movements were very significant in the formation of the Chinese continent.

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Study of tectonics of the Chinese continent has two principal trends -- geological and geodynamic.

On the basis of a study of the phases of sedimentary rocks, the composition and distribution of fossil fauna, the types of volcanic rocks and folding, platform (i.e., stable or slightly folded) areas and geosynclinal (i.e., movable or intensely folded) areas in various geological periods have been discovered. The distribution of various strongly folded zones, and forms of structural units forming certain zones have been studied by analyzing the interaction between stress and strain. The results of this analysis make it possible to determine the types of structure of a given geological period and to establish the interrelation between them.

As a result of the development of this field of geology, the following conclusions were drawn regarding the formation of the Chinese continent. The existence of latitudinal zone, particularly marked in certain latitudes, was established. Most widely developed is the "catasiatic" structural line and, in connection therewith, the fault dislocations in eastern China and on the Pacific coast. Among existing structural types of displacement deformation, the basic types are the E-shaped structures and arches, located on the periphery of the continent. These deformations reached their highest development after the Jurassic period. The greatest curvatures in these structures occur on the summits, which are widely extended and are often accompanied by intrusives and ore deposits. A great deal of research on these deformations was done by Li Ssu-kuang; considerable work on the separation of the tectonic units of China was done by Huang Ch'i-ts'en.

Between 1937 and 1949, geological work in China was disturbed and disorganized by the intervention of the Japanese and later the American imperialists. The reactionary ruling classes of China tried to restrict geological research, but the geologists continued to work steadily and achieved certain successes. For example, in Lu-feng Hsien, Yunnan Province, vertebrate fossils of the Triassic period, including numerous reptiles (Saurichian) and mammals (Deinotherium), were found. These finds are extremely important in the classification and study of the evolution of vertebrates. At the same time, relatively detailed studies were made of the strata of southwest China and the petroleum-bearing areas of northwest China. Geological maps of the whole of China were compiled on the scale of 1:1,000,000 and 1:3,000,000, as well as geological maps of Szechwan and Kiangsi provinces on the scale of 1:200,000 and of Kwangsi Province on a scale of 1:250,000. A detailed study was made of the Tertiary vulcanogenic rocks around Nanking. Research was also done on the metamorphic zonality of eastern Sikang and other regions.

It is evident from the above that although geological research in old China, played a certain part in the development of geological science, it was scattered, unplanned, and completely alien to the practical life and needs of the people. It was thus not properly developed in the past.

After the establishment of the people's government, geological work developed anew. Under the leadership of the Chinese Communist Party, large-scale construction is being carried out, requiring close coordination with geological research and prospecting for mineral deposits. The work of geologists in China has taken a new direction and has begun to serve the people.

The complex geological expeditions to the Northeast, organized in 1950, combined the work of several previous organizations in China. These expeditions formed the foundation for the organization of a single administration of geological research, the Committee for the Administration and Planning of Geological Work, which gradually took over the supervision of all work in that

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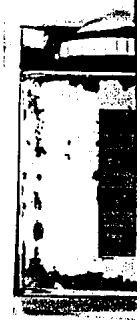

field. This committee was the predecessor of the Ministry of Geology, which was formed in September 1952. All geological institutions in China were subsequently reorganized, and, to meet national requirements, all geological work was concentrated on problems connected with economic construction. The Institute of Geology and the Insitute of Paleontology of the Academia Sinica were temporarily placed under the jurisidiction of the Ministry of Geology, although the Cabinet for the Study of Ancient Vertebrates remained under the academy. Geological administrations of the Central-South, Southwest, North China, Northwest, Northeast, and East China administrative areas were organized in the cities of Hankow, Chungking, Kalgan, Sian, Ch'ang-ch'un, and Nanking, respectively.

During the past 2 years, the geological service has concentrated entirely on meeting the requirements of national economic development, the prospecting of mineral resources, and the supplying of necessary data for hydraulic engineering construction. Prospecting for mineral resources is carried out with two ends in view. First, deposits are prospected to meet the requirements of industry. During the past few years, more than 60 percent of Chinese geologists have been employed in prospecting for iron, manganese, copper, tungsten, tin, coal, and petroleum deposits. Second, much prospecting is carried out in order to discover new regions of deposits of useful minerals. In addition to the prospecting work carried out in China proper, the Academia Sinica sent a scientific expedition, which included a number of geologists, to Tibet in the spring of 1951.

Prospecting for and surveying of deposits of useful minerals have met with definite success. Copper-nickel and scheelites have been found in the Northeast and copper ore deposits have been found east of Tsinghai Province and south of Shensi Province.

In the field of hydraulic engineering construction, geologists are taking an active part in the work of regulating the Huai Ho. Work is also being done in connection with the construction of new railways.

Little has been done in the field of geological scientific research work, but some practical investigations have been coordinated with the scientific research in progress. For example, the age of the Lower Paleozoic formations of the Northeast, in the T'ai-ts'a Ho area, has been found. The study of Phoroxylon, belonging to plant fossils found in the northern part of the Northeast, is of great importance in botany. Remnants of fossil flora have provided a definite solution to the problem of the Upper Permian Era of the Shi-t'ien-fang formation, as well as the problem of the existence of the Upper Devonian in the provinces of Hupeh, Kwangtung, Kiangsi, and Kansv. On the basis of study of trilobites, it was determined that a large part of the "Mantos" clay formation Shantung (Province), which was formerly considered to be Lower Cambrian was actually of the Middle Cambrian era. The existence of Devonian deposits in western Hupeh Province has been established. With the help of local workers, numerous remnants of fossil vertebrates were found, especially in Lai-yang Hsien, Shantung Province. Also, a large number of extremely well preserved fossil lizards of the Upper Cretaceous period have been discovered.

During research work at Ch'ou-k'ou-tien, the teeth of a prehistoric man were found and traces of the Quaternary glacial period were observed. In studying the Hsi-shan range, near Peiping, various chloritoids were found, which had been formed under the influence of dynamic metamorphism. With the aid of X-ray and microscopic investigation, it was possible to determine the general laws governing the formation of agate and silicified wood. By experimental research and field observations, a connection was established

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between the formation of folds and fractures, fissures and cleavage structures. Research has begun on discovering connections among the E-shaped structure, the "catasiatic" structure, latitudinal folding, and the platform and geosynclinal structures.

Geological institutes have been opened in Peiping and Ch'ang-ch'un for the purpose of training geological cadres. The Peiping institute has been organized from the geological faculties of the Peiping, Tsinghua, and Tientsin universities and the Tien-shan Institute of Transportation. In the Ch'ang-ch'un institute, the geological faculties of Shantung University and the Geological Tekhnikum of the Northeast have been combined and expanded. Over 5,000 students, including students of the former geological faculties, are now being trained in geological institutes. In addition, there are geological colleges for training students with secondary school education in the cities of Nanking, Hankow, and Chungking. At present, about 8,000 students are enrolled in geological institutes and colleges.

The formation of a single leading geological organization and the feeling of collectivity which has developed among Chinese geologists during their practical work of the past few years have led to closer cooperation among them. The steps taken to raise the ideological level of scientific workers and to develop criticism and self-criticism guarantee a further improvement of geological work in the new China.

The speedy development of geology is closely connected with the assistance received by the people of China from the Soviet Union. The USSR not only supplies China with various geological prospecting equipment, but also sends numerous specialists to China. These specialists are cooperating with Chinese geologists and are sharing the theories developed by Soviet scientists and the practical experience gained by the Soviet Union in the field of geology. With the aid of Soviet specialists, it has been possible to disprove the erroneous opinion of bourgeois geologists that China was poor in petroleum and copper. Petroleum was found in the limestones of the Ordovician period of Hopeh Province, and copper ores, related to the formation of secondary quartzites, were discovered in the southern part of Shensi Province. This indicates the error of the statements by bourgeois geologists that petroleum is found in China only in marine tertiary deposits and that China has no copper deposits of porphritic ores.

At present, Chinese geologists are making efforts to master progressive Soviet theory and experience in the prospecting of useful minerals. Geological institutes and colleges use Soviet methods of instruction and Soviet teaching programs. Geologists are striving to master the Russian language. They are given the task of learning the principles of grammar and the elementary vocabulary used in geological literature (about 200 words) in a period of one month, and in this way will be able to read Russian geological literature with the help of a dictionary.

In January-February 1953, the Ministry of Geology called a conference of geological workers of all China. The chief purpose of the conference was to familiarize the workers with leading Soviet geological theories and the practical experience of Soviet geologists. Most of the time was devoted to discussing the reports of Soviet geologists. The reports contained statements and discussions of the basic requirements of prospecting work, as well as of problems of classification, estimates of reserves of mineral resources, geological work at the site of deposits during mining operations, prospecting for nonferrous metals, iron, coal, and petroleum, problems of hydrogeology and engineering geology, and methods of scientific work. The conference enabled Chinese geologists to become acquainted with the leading Soviet scientific methods and to review their own outdated opinions.

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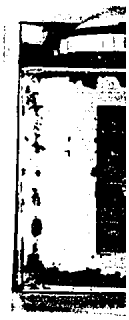

It must be admitted, however, that the Chinese are doing little to study and popularize leading Soviet geological theory and practice. With the aid of Soviet scientists, it is certain that an expansion and deepening of the study of Soviet geology will raise the level of Chinese geology.

PRESENT POSITION OF MATHEMATICS IN CHINA

Vestnik Akademii Nauk SSSR,
No 6, 1953, pages 14-20

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Academia Sinica

Mathematics in China has a history of many centuries. The creative works on mathematics in ancient China were remarkable. For example, in 460 the Chinese mathematician Ts'u Ch'ung-ch'i had calculated that the value of pi is included in the limits from 3.1415926 to 3.1415927. He took 113/355 as an approximate value of pi. In 1247, the Chinese mathematician Ch'in Ch'iu-shao devised a method for approximately computing the roots of an equation, ordinarily called Horner's method. About 1200, the so-called Pascal triangle was found, called "kai-fang-ch'a-liang-tu" in Chinese.

However, during the prolonged dominance of feudalism, the further development of mathematics in China ceased. Moreover, a considerable period from 1367 to 1750, was marked by signs of regression. The mathematicians of this period not only did not develop the successes of their predecessors, but also were unable to grasp their remarkable attainments. An example is the forgetting of the method for solving systems of equations with four unknowns, which was discovered as early as 1303.

At the end of the 16th century, as a result of the development of navigation, advanced mathematical knowledge and methods from the West began to penetrate China. Chinese mathematicians seized upon these methods and began to study the works of their own predecessors on the basis of this new information. In particular, they again studied the long-forgotten method for solving a system with four unknowns.

However, China has actually started on the path of present-day mathematical investigations only in the last 25 years. In this period, Chinese mathematicians have written about 1,100 works (besides works on applied mathematics).

An object of systematic study was Fourier series. A larger number of mathematicians worked in this field. Outstanding among these is Ch'en Chien-kung.

Ch'en Chien-kung began to work in 1928. Independently of Western mathematicians (M. Riesz, Hardy, and Littlewood), he found the necessary and sufficient condition for the absolute convergence of trigonometric series; he considered the set (svertka) of two functions and showed that if a trigonometric series converges everywhere absolutely to $f(x)$, then $f(x)$ can be represented as the set of two functions from L^2, and conversely.

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It is necessary to note also the works of Ch'en Chien-kung on orthogonal series. Some of them overlap the investigations of D. Ye. Men'shov. In particular, Ch'en Chien-kung established the equivalence of the following two familiar theorems:

(1) If $\sum (\log n)^2 \cdot c_n^2 < \infty$, then $\sum c_n f_n(x)$ converges almost everywhere.

(2) If $\sum (\log\log n)^2 \cdot c_n^2 < \infty$, then $\sum c_n f_n(x)$ (C, 1) almost everywhere.

Incidentally, Ch'en Chien-kung established the equivalence of the first theorem (and consequently also of the second theorem) to the following fact:

(3) If $\sum (\log\log n)^2 c_n^2 < \infty$, then the sequence of partial sums $S(x,2)$, $S(x,2^2), \ldots , S(x,2^n)$ converges almost everywhere (here $S[s,p]$ means the p-th partial sum of the series $\sum c_n \varphi_n(x)$).

Another important problem, long ago studied by Chinese mathematicians, is the summability of trigonometric series.

As for strong summability, Wang Fu-ch'un demonstrated in 1945 that the Fourier series of the function $f(x)$ possesses strong summability under the condition that

$$\int_0^t |\varphi(u)| \cdot \left\{1+\log^+|\varphi(u)|\right\} \cdot du = o(t),$$

where $t \to 0$, and $\varphi(u) = \frac{1}{2}\left\{f(x+u)+f(x-u) - 2S\right\}$.

This result represents the solution of the problem posed by Hardy and Littlewood.

The works of Wang Fu-ch'un on the Riesz summability are very profound. According to Hardy and Littlewood, the conditions

(1) $\int_0^t |\varphi(u)| \cdot du = o\left(t \left|\log \frac{1}{t}\right|\right)$, where $t \to +0$,

(2) $a_n \geq -kn^{-\delta}$, $\delta > 0$ (a_n: Fourier co-efficient)

ensure the convergence of the Fourier series of an integrable function.

Wang Fu-ch'un demonstrated by an example that under condition (1) it is possible to replace $|\varphi(u)|$ by $\varphi(u)$. He also obtained many results by investigating the Riesz summability of Fourier series under various conditions.

Many mathematicians have undertaken the study of Fourier series under the guidance of Ch'en Chien-kung. One of these is Cheng Min-te, who demonstrated that if the spherical partial sums

$$S_N(x,y) = \sum_{\nu=0}^{N} \left(\sum_{m^2+n^2=\nu} c_{m,n} \cdot e^{i(mx+ny)} \right)$$

of the double trigonometric series

$$\sum_{m=-\infty}^{\infty} \sum_{n=-\infty}^{\infty} c_{m,n} e^{i(mx+ny)}$$

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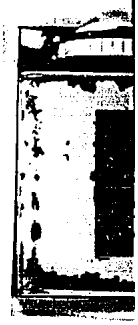

are summable (C,2) everywhere to zero and

$$C_{m,n} = O\left[(m^2+n^2)^{-\varepsilon}\right]$$

where epsilon (ε) is any positive number, then the trigonometric series identically equals zero.

The first works of Su Pu-ch'ing mainly concern differential geometry in affine space, especially affine theory of surfaces of rotation. He extended the characteristic properties of a surface of rotation in Euclidean space to affine space and determined such surfaces. Among the many other works of Su Pu-ch'ing on the theory of surfaces in affine space, is his investigation of the second-order Mutard surface.

Su Pu-ch'ing has guided investigations on projective differential geometry. The principal successes here have been attained in two fields:

1. In the field of curve theory, where Su Pu-ch'ing and Ch'ang Su-cheng have investigated the properties of singular points of curves on a plane and in a space, and have studied, with the aid of these points, the curves in projective space.

2. In the field surface theory, where Ch'ang Su-cheng has discovered certain properties of linear surfaces, and Pai Ch'ing-kuo has solved the Fubini problem concerning asymptotic curves on surfaces.

Su Pu-ch'ing's investigations on linear complexes and his study of the Laplace sequence with period 4 have been closely connected with the work of S. P. Finikov.

Recently, Su Pu-ch'ing has undertaken to generalize the theory of connectivity in a space of K-spread, where the principal results concern the theory of declinations in a Finsler-Cartan space.

A large group of mathematicians is working under the direction of Su Pu-ch'ing.

It is also necessary to note the recent attainments of Sun Tse-ying. The familiar problem of the equivalence of generalized spaces, which has begun to be studied by means of tensor analysis, has been worked out purely geometrically by Sun Tse-ying; his results are significantly better than previous ones.

Integral geometry has been undertaken mainly by Wu Ta-jen, who has extended the main kinematic formulas of integral geometry to double points in the theory of curves and has employed the dual formula of the principal formula in the field of integral geometry, hence obtaining a number of integral formulas. Wu Ta-jen has developed certain basic results of integral geometry in elliptic space.

Prof Yen Ch'i-ta has considered the main kinematic formulas in n-dimensional space.

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Combinatorial topology assumed a leading position in the investigations of the Institute of Mathematics at the Central Academy. Therefore the number of topologists was large. Unfortunately, some of them went to the US, when Chiang Kai-shek compelled the Institute of Mathematics to move to Taiwan. However, they returned to China. I shall discuss the topologists who remained in China.

Ch'iang Ch'e-han turned from variational calculus in general to topology and is now working mainly on the theory of manifolds. Ch'ang Su-ch'eng studied homotopic types and problems relating to them. Yen Ch'i-ta studied the topological properties of Lie groups and differential geometry; he found the Poincare polynomials for five exceptional Lie groups.

Soviet mathematics exerted the strongest influence on the analytical theory of numbers. Hua Lo-keng (author of this article) began to undertake and to direct works in this field in China. His first acquaintance with the works of Soviet mathematicians was in 1935. He studied certain basic results obtained in the Petersburg school, mainly the works of Academician I. M. Vinogtadov, and extensively employed Vinogradov's method in various problems of number theory.

Hua Lo-keng's first general work, which summarized his investigations, was completed in 1940 and published in Volume XXII of the Trudy Matematicheskogo Instituta imeni V. A. Steklova Akademii Nauk SSSR (Works of the Mathematical Institute imeni V. A. Steklov of the Academy of Sciences USSR). This work mainly concerned the Waring problem with prime unknowns and system of equations with prime unknowns.

Hua Lo-keng also concluded a number of other works. In the Terry problem he obtained the upper bound for M(k):

$$M(k) \leq (k+1)\left\{\left[\frac{\log \frac{1}{2}(k+2)}{\log (k+1) - \log k}\right] + 1\right\}$$

He demonstrated that the absolute minimum primitive root module prime p is less than $2^m\sqrt{p}$, where m is the number of various prime divisors of (p-1). These works are closely connected with the works of Academician I. M. Vinogradov. The method obtained by Hua Lo-keng in the field of the complete trigonometric sum not only simplifies past existing proofs, but also is applicable in the field of algebraic theory of numbers and in the special series of the Terry problem.

In the field of the analytical theory of numbers, Hua Lo-keng, together with his associate Min Ssu-hao, studied the double trigonometric sum

$$\sum_{x=1}^{p}\sum_{y=1}^{p}\exp\left[2\pi i f(x,y)\middle|p\right],$$

where f(x,y) is a polynomial of power k with integral coefficients, and p is a prime number. It was demonstrated that for certain conditions this sum equals $O(p^{2-\frac{2}{k}})$.

Later Min Ssu-hao generalized this result to the case of n-variables.

In 1947 Min Ssu-hao demonstrated that

$$\zeta\left(\tfrac{1}{2}+it\right) = O\left(t^{\frac{1}{52}-\varepsilon}\right).$$

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He simplified the result of Selberg and computed that the number of zeros on the critical line with imaginary parts that do not exceed T is greater than AT'log T, where A approximately equals 1/120,000.

The theory of probability and mathematical statistics were developed in China only after 1935, when certain Chinese students began to study mathematical statistics in England. After 4-5 years they had mastered the theory on the verification of hypotheses, which had been developed in the Fisher school, and obtained good results. Most remarkable were the works of Hsu Pao-lu, who, in his numerous works, developed new mathematical techniques for these problems. However, the attainments of the advanced Soviet school were then unknown in China; thus, the theory of probability and mathematical statistics were not then developed as at present in China.

After the establishment of the people's rule in our country, Hsu Pao-lu, studying together with his students the relations between the behavior of a characteristics function around zero and the behavior of a distribution function at infinity, obtained the necessary and sufficient conditions for the existence of the absolute moment of a given order in terms of the behavior of the characteristic function in the neighborhood of zero.

The development of algebra in China belongs to a comparatively later time. A notable contribution to this field of mathematics was made by Ts'eng Ch'iung-ch'i, who studied algebras with division over a functional algebraic field. But he died early, and his trend of investigations has not received further development in China.

The first and systematically working colloquium on modern algebra began in China in the autumn of 1938. At first, it was occupied with the theory of groups and achieved certain successes in connection with the theory of finite groups. One of the most remarkable successes in algebra, was the work of Wang Hsiang-hao, who pointed out the inaccuracy of the Granwald theorem.

The most notable of the works by Hua Lo-keng is the solution of the problem of the semiautomorphism of a body; this problem is connected with the basic theorem of a one-dimensional projective geometry over an arbitrary body.

Hua Lo-keng to study the geometry of matrices in 1940 and continues to work in this field. He generalized his principal results to the case where the elements of a matrix are taken from an arbitrary body. These results are closely connected with the theory of linear groups, Lie rings, Jordan rings, and the theory of functions with several variables.

Sung Pen-wang has conducted investigations on the differential geometry of matrices.

The theory of functions of a complex variable has obtained manifold development in China. Works in this field concerned various problems and were characterized by considerable depth and breadth of the scope of phenomena. Thus, investigations were conducted on interpolation and approximation, meromorphic functions, Dirichlet series, quasianalytical functions, special functions, the theory of functions with several variables, and the theory of schlicht (simple) functions.

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In the theory of schlicht functions, for example, the following result was obtained as early as 1933: If the function

$$f(z) = z + \sum_{r=1}^{\infty} a_{kr+1} \cdot z^{kr+1}$$

is a schlicht function within the unit circle 1 and k equals either 1, or 2, or 3, then the evaluation

$$\left|a_n\right| \leq e^k$$

is correct for the coefficients a_n of this function.

In the field of the theory of schlicht functions, a comparatively large number of mathematicians has been working under the guidance of Ch'en Chien-kung. These mathematicians are now studying the method of the Soviet mathematician G. M. Goluzin and are applying this method in their investigations.

Much has been done on the history of ancient Chinese mathematics by Li Yen and Ch'ien Pao-ts'ung, who have investigated the problem of the time of appearance of ancient works and have modernized the symbols and formulas employed by ancient Chinese mathematicians. They have contibuted much valuable material for the study of the history of ancient mathematics in China, and for the compilation of the history of mathematic's development in our country.

Before the proclamation of the People's Republic of China, universities and scientific institutions in China conducted certain mathematical investigations that did not require any equipment; in a number of fields, definite successes were gained. However, these investigations proceeded slowly, of their own accord, and without plan. The investigations had no definite direction to their operations; direction varied according to the personal interests of the teachers. Moreover, these interests were usually dictated by the "modes" of bourgeois countries. The advanced Soviet mathematical investigations were generally little known. Many in China considered mathematics a play of the imagination devoid of practical purpose and did not understand that mathematics arises from the requirements of practice and from experience. Such a position was natural under former conditions.

The great victory of the Chinese people cleared the way for the development of all the sciences, of which mathematics is one.

Soon after the organization in the People's China of the Academia Sinica, the Institute of Mathematics was created. The number of students in the mathematical faculties of universities was increased. Under the guiding influence of the Chinese Communists Party and of the people's government of China, mathematicians realized the practical significance of their operations, and perceived that the purpose of mathematics, as in other sciences, is to serve the native land.

In China, all obstacles that had impeded the study of the attainments of advanced Soviet science were liquidated. Chinese scientific workers are now learning with great enthusiasm from their Soviet colleagues.

Most instructors in the universities have learned to read, with the help of a dictionary, literature in Russian and have worked out plans to translate many books from Russian into Chinese. Already, at least 30 volumes have been

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published or are being translated. The first volume of Academician V. I. Smirnov's Kurs Vysshey Matematiki (A Course of Higher Mathematics) and of Academician I. M. Vinogradov's Osnoy Teorii Chisel (Principles of the Theory of Numbers) have already become our textbooks.

The Institute of Mathematics is conducting profound investigations of the results of the Petersburg school in numbers theory. In particular, special attention is being paid to the works of Academician I. M. Vinogradov and of Prof Yu. V. Linnik. The works of G. M. Goluzin on schlicht functions are exerting great influence on our work. In the field of theory of probability and mathematical statistics, our students are learning from the Soviet school directed by Academician A. N. Kolmogorov. Colloquia are being held on the works of I. M. Gel'fand and M. A. Naymark. The symposium entitled 30 Let Sovetskoy Matematiki (Thirty Years of Soviet Mathematics) has been almost completely translated into Chinese. We plan to translate all the mathematical works that win Stalin prizes.

In the process of strengthening the indestructible friendship of China and the Soviet Union, a close cooperation with Soviet scientists has become the desire of all Chinese mathematicians.

Chinese mathematicians are carefully considering the ways for the further development of our science. We propose to initiate study of those branches of mathematics that were only little or not at all studied in China, e. g., functional analysis and others. We propose to develop those branches that have some foundation in the past, e.g., the theory of functions with several variables and other studies. Also, we propose to improve the quality of investigations in those fields that have a fairly good foundation, e.g., Fourier series.

Problems still exist in all fields of Chinese mathematics; also there are many weak spots, although not in all branches. Thus, at present, it is difficult to look forward to the time when, in 5-10 years, the study of mathematics in China will encompass all branches of this science, as in the case of our esteemed Soviet colleagues.

Therefore, we cannot distinguish the important from the second-rate and the urgent from the nonurgent, depending on the practical requirements of the state. We have resolved to make differential and integral equations, which posses direct practical value, and functional analysis, which is important for mathematics itself, the bases of the development of our mathematics. These fields had not been appreciated enough by the mathematical community of China in the semifeudalistic and semicolonial past of China.

Finally, to turn our attention to what is basic does not mean to forget the rest. We shall consolidate those branches that already possess attainments, for example, analysis of Fourier series, analytical theory of numbers, topology, and differential geometry.

We believe that, under the wise guidance of the Chinese Communist Party and of Chairman Mao Tse-tung, we shall succeed, by studying the advanced experience of the Soviet Union, in quickly developing and strengthening our science, in order that it may play its proper role in the economic and cultural development of China.

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CHEMISTRY IN CHINA

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No 6, 1953, pages 21-24

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In old China, which was long under the yoke of the imperialists, and then later under the yoke of the reactionary Kuomintang government, chemical research did not advance very far.

At first, such research was begun in the field of analytic chemistry during World War I; analyses of coal and mineral ores were made rather systematically. By 1930, in the institutions of higher learning, a transition was gradually made to research in the field of food, physical, and pharmaceutical chemistry. But all this work was conducted unsystematically. Somewhat later, special research establishments were set up, in which research work was carried out in organic, physical, pharmaceutical, and industrial chemistry.

Research in organic chemistry was directed toward the synthesis of styrene compounds and a number of other organic compounds. Work in pharmaceutical chemistry had to do with vegetable alkaloids and glucosides contained in Chinese medicinal herbs. Research in physical chemistry included the study of the absorption spectra of polyatomic molecules of linear structure, the stereochemistry of biphenyl, the Joule-Jay-Thompson effect in the field of ideal gases, and the phase equilibrium of metals. In industrial chemistry, research has been conducted on bauxites, water-soluble salts obtained in fermentation processes, coal, liquid fuel, ceramics and porcelain, tung oil, lacquers, oils, fats, and the smelting of vanadium, tungsten, and other metals. The results of this research served as a foundation for the creation of certain branches of industry. For example, production of soda by the Ho Te-pang method was organized.

When the war of resistance against the Japanese aggressors was begun, a large part of the research was discontinued, and only some work in the field of industrial chemistry was continued. For example, a study was made of the feasibility of obtaining benzene, mazut, and lubricating oils from vegetable oils. The production of paper from local raw materials, and the production of artificial leather, fireproof materials, plastics, etc. were also studied. The technology of the processes of wood distillation was developed. On the basis of the results of some of this research, industrial production was set up on a small scale.

After the expulsion of the Japanese aggressors, the basis for research in the areas under Kuomintang rule virtually ceased to exist, in view of the fact that the corrupt Kuomintang regime permitted the dumping of goods by the American imperialists. All research, except work of dyestuffs and the processing of medicinals, stopped.

Favorable conditions for the development of science in New China were established only after the victory of the Chinese people's revolution. After the reorganization of the state economy and the renewal and growth of production, research in chemistry was also developed. During the more than 3 years since the establishment of the people's hegemony, the volume and scope of chemical research expanded considerably.

At present, besides analytical and research laboratories in the factories and plants, there are 11 chemical scientific research establishments in China, including five institutes of the Academia Sinica. In scale of research, these institutes differ widely. Also, the number of scientific workers varies from 50 to several hundred, and the subjects of research vary.

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In the Complex Research Institute, half the research is on industrial chemistry; the principal work is done on synthetic rubber, cellulose chemistry, rare elements, etc. The Institute of Industrial Chemistry is concerned with problems of crude petroleum, synthetic liquid fuel, lubricating oils, and fireproof materials. In the Institute of Organic Chemistry, studies are being made of compounds of high molecular weight, antibiotics, and vitamins. The Institute of Pharmaceutical Chemistry is working on the synthesis of special drugs and of Chinese medicines. At the Institute of Physical Chemistry, research is being conducted in molecular spectral analysis, fluorescence chemistry, applied electrochemistry, and other subjects.

In addition, at six scientific research institutes subordinated to administrations studies are being made of shale oils, vegetable oils and fats, organosilicon compounds, inorganic salts, the chemical composition of sea water, problems of the technology of producing paper, ceramics, porcelain, and rubber, problems of skin tanning, etc. Scientific reports and articles are published in the Chemical Bulletin, the Scientific Research Bulletin of Northeast China, the Bulletin of Chemical Industry, Scientific Communications, and other publications.

The basic chemical research carried on in the New China is divided into three groups. The first group includes research pertaining to the needs of state construction, for example, research on liquid fuels, compounds of high molecular weight, dyes, inorganic salts, refractory materials, etc. The second group includes research connected with the urgent demands of the various branches of production, for example, research on cylinder oil, gas carbon black, articles made from carborundum, vanadium catalysts, etc. The third group includes those works which are a continuation of research begun in the past, comprising pharmaceutical chemistry, molecular spectroscopy, theoretical work conducted with the aid of calculation methods, and research in physical and organic chemistry.

The bulk of research is in the first group. The principal fields of chemical research conducted at the scientific research institutes are as follows:

Physical Chemistry -- Calculation of specific heat by the mechanical quadrature method; the general constructional method of the functions of chemical bonds; the theory of hindered rotation; the average length and average radius of organic molecules with a straight chain, and the average radius of the molecules of various rubbers; the calculation of the equilibrium constant in the exchange of isotopes; and the kinetic theory of ionomolecular reactions.

Organic Chemistry -- Research on steroids; the structure of citromycetin; the synthesis of compounds of the terpene series; research on growth stimulants; and the synthesis of aliphatic amines with a branched chain.

Drugs -- Chinese medicinal herbs, for example, Atropa belladonna, "pei-mu," Fritillaria Roylei, digitalis, "ch'iu-lo" (films under the rind of tangerines), "ch'ing-kno-lan"; antibiotics, i.e., streptomycin, aureomycin, and citromycetin (penicillin and chloromycetin were successfully studied); and vitamins (for example, vitamin D).

Analytical Chemistry -- Azo dyes as reagents for precipitation; the analysis of rare elements; polarographic analysis.

Research in the field of heavy organic synthesis includes problems pertaining to the manufacture of dyestuffs, intermediate petroleum products, and [synthetic] liquid fuel, and problems of producing liquid fuel from carbon monoxide and hydrogen, artificial fibers and protein substances, synthetic rubber, synthetic resins, and agricultural preparations.

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Basic research on dyestuffs and intermediate products is aimed at satisfying the requirements of industry. Consideration is also given to the problems of training scientific research personnel, in order to ensure expansion of research.

Research conducted at present includes questions relating to various dyestuffs, azo dyestuffs, and anthraquinone dyestuffs. Much of this research is carried on under the direct guidance of Soviet specialists, and the organization of the production at experimental plants of intermediate products and dyestuffs has been based on Soviet advanced methods.

The study of raw petroleum has been successful, first of all, in regard to its catalytic cracking. At present, work is being done on the aromatization of petroleum; work on the polymerization of gases by cracking has been completed. Two methods for eliminating salts from petroleum are being studied: (1) under high pressure, and (2) with the aid of chemical reagents. An inhibitor of the resinification of gasoline was synthetically prepared. By the introduction of this inhibitor, the induction period of cracking gasoline was increased up to 5 hours. Research was carried out on various lubricating oils, derived from petroleum, and also on additives to lubricating oils.

Research in the utilization of shale oils and coal pitch is being developed in the following directions: hydrogenation in the liquid phase; hydrogenation in the gas phase; synthesis of cylinder oil from chlorinated shale paraffin (the method worked out has already been adopted in industry); and synthesis of lubricating oils by treating shale oils with sulfuric acid (the oil resulting from the conversion is of a high quality; the method developed has also been adopted in industry).

Positive results have been achieved in the synthesis of liquid fuel from carbon monoxide and hydrogen; in work on the substitution of the cobalt catalyst by a precipitated iron catalyst; in the synthesis of gasoline under average pressures, with a chlorinated, fused iron catalyst; and in the aromatization of synthetic oils.

As the result of research on fibers and protection substances, a method has been developed for obtaining cellulose from straw and speckled bamboo. This method is being introduced into industrial production. Also, in the experimental plants, chlorination is being used to manufacture cellulose from the stalks of cultivated cereals. The method for producing artificial cotton and wool from rayon fiber has been mastered; research is being carried on to obtain wool and plastics from the proteins of soybeans.

Work in synthetic rubbers is concerned with butadiene-styrene, chloroprene, and polysulfide rubbers. In connection with this work, research was also carried out on the production of carbon black from natural gas and mazut.

Success has been attained in the study of synthetic resins. A phenol-formaldehyde resin was prepared, which is used for the laying of acidproof brick; research is being conducted on the synthesis of polyvinyl butyl, and also on the synthesis and polymerization of organosilicon compounds. A process developed for the production of sulfonated coal has already been introduced into industrial practice. As the result of research on oil-soluble phenol-formaldehyde and polyatomic ester resins, the possibility of using phenol-formaldehyde resins as insulation varnish was revealed. Industrial production of this new varnish has already been started.

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Considerable success has attended the development of agricultural chemicals. Research has produced an organic mercury compound which, at present, is passing tests as a disinfectant. A method for preparing hexachlorobenzene has been developed and passed along to industry for assimilation.

Research on a copper-containing disinfectant has been successfully carried out. Certain positive results have been attained in the synthesis of organophosphorus compounds.

In the area of inorganic technical chemistry, the possibility of industry's using the method of preparing soda lye (the Ho Te-pang method) is being further studied. Research is being conducted along the lines of improving the quality of sulfides of alkali metals, and also of obtaining iodine and potassium from sea water. In addition, research is being done on lime for bleaching.

In the production of salts, the possibility of obtaining salts of vanadium, cobalt, and thorium has been studied; as the result of research on the vanadium salt, the problem of preparing a vanadium catalyst for the production of sulfuric acid was resolved. Besides, work was done on obtaining potassium salts and borax in northwest China.

In the field of refractory materials, Dinas brick, clay, magnesite brick, and carborundum products were investigated. The problem of manufacturing green carborundum, as well that of finding materials for the packing of a zinc-smelting furnace were solved.

At present, sampling on natural kaolin, as well as an investigation of the properties of this material, has begun.

Through the support of the party and government, and the disinterested aid of the Soviet Union, Chinese chemists have achieved definite success in their research labors. But these attainments seriously lag behind the needs of the building of a New China. In the future, we shall have to work still more diligently, and study even more carefully the advanced science and techniques of the Soviet Union, so that we can promote in our country, in every way possible, the most rapid tempo of construction.

CHINESE SCIENTISTS MENTIONED IN THIS REPORT

/The following list of Chinese scientists mentioned in this report has been compiled for ease of reference. The English transliteration of the Russian version of the Chinese name is given in column 2. This is converted to the Wade-Giles spelling in column 1, and, from the Wade-Giles rendition, the Chinese characters, where known, have been shown in column 3./

Wade-Giles Spelling	English Transliteration of Russian Version	Chinese Character Where Known	Field
Chang Hung-jao	Chzhan Khun-zheo		Geology
Ch'ang Su-ch'eng	Chzhan Su-chen		Math
Chang Ts'ung-su	Chzhan Tszun-suy		Physics
Chang Wen-yu	Chzhan Ven'-yuy	張文佑	Physics Geology
Ch'ao Ch'ung-yao	Chzhao Chzhun-yao		Physics

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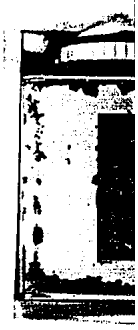

Wade-Giles Spelling	English Transliteration of Russian Version	Chinese Character Where Known	Field
Ch'en Chien-kung	Chen' Tsyan'-gun	陳建功	Math
Ch'en Hsueh	Chen' Syuy		Geology
Ch'eng Hua-ch'i	Chzhen Khua-chi		Physics
Ch'eng Min-te	Chen Min-de	程民德	Math
Ch'eng Mai-lan	Chzhen Moi-lan'		Physics
Ch'iang Ch'e-han	Tszyan Tsze-khan'		Math
Ch'ien Lin-chao	Tsyan' Lin'-chzhao	錢臨照	Physics
Ch'ien Pao-ts'ung	Tsyan' Bao-tszun		Math
Ch'ien San-ch'iang	Tsyan' San'-tsyan	錢三強	Physics
Ch'ien Sui-sen	Tsyan' Syue-sen'		Physics
Ch'ien Wei-ch'ang	Tsyan' Vey-chan	錢偉長	Physics
Chou P'ei-yuah	Chzhou Pey-yuan'	周培源	Physics
Ho Tse-hui	Khe Tsze-khoy	何澤慧	Physics
Ho Ts'o-ling	Khe Tszo-lin		Geology
Hou Te-feng	Khou De-fen	侯德封	Geology
Hsieh Chia-jung	Se Tszya-zhun	謝家榮	Geology
Hsu Pao-lu	Syuy Bao-lu	許寶祿	Math
Hsueh Ts'e	Syuy Tsze		Geology
Hu Kang-fu	Khu Gan-fu		Physics
Hu Ning	Khu Nin		Physics
Hua Lo-keng	Khua Lo-ken	華羅庚	Math
Huang Ch'i-ts'en	Khuan Tszi-tsyn'		Geology
Huang K'un	Khuan Kun'		Physics
Ko T'ing-su	Ge Tin-suy		Physics
Li Ssu-kuang	Li Sy-guan	李四光	Geology
Li Yao-pang	Li Yao-ban		Physics
Li Yen	Li Yan'	李儼	Math
Lin Ch'ia-ch'ao	Lin' Tszya-tszyao		Physics
Lu Ho-fu	Lu Kho-fu		Physics

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Lu Ta-kang	Lyu Da-gan		Physics
Ma Hsi-ts'un	Ma Shi-tszyun'		Physics
Meng Sun-ming	Men Syan'-min'		Geology
Min Nai-ta	Min' Nai-da		Physics
Min Ssu-hao	Min' Sy-khe	閔 嗣 鶴	Math
Pai Ch'ing-kuo	Bay Chzhin-go		Math
Pei Pan-cheng	Pey Ban'-chzhyn		Geology
Peng Huan-wu	Pen Khuan'-u		Physics
P'eng Shao-i	Pen Shao-i		Chemistry
Su Pu-ch'ing	Su Bo-tsin	蘇 步 青	Math
Shih Ju-wei	Shi Zhu-vey		Physics
Sun Tse-ying	Sun Tsze-in	孫 澤 瀛	Math
Sun Yun-chu	Sun' Yun'-chzhu	孫 雲 鑄	Geology
Sung Pen-wang	Sun Ben'-van		Math
T'ien Ch'i-ch'un	Tyan' Tsi-tszyun'		Geology
Ting Hsi-lin	Din Si-lin'	丁 西 林	Physics
Ts'ai Po-ling	Tsay Bo-lin		Physics
Ts'eng Ch'iung-ch'i	Tszen Tszyun-chzhi		Math
Wang Ch'u-hsi	Van Chzhu-si		Physics
Wang Fu-ch'un	Van Fu-chun'		Math
Wang Hsiang-hao	Van Syan-khao		Math
Wang Kan-ch'ang	Van Gan-chan	王 淦 昌	Physics
Wang Ta-heng	Van Da-khen	王 大 珩	Physics
Wu Hsueh-chou	U Syuye-chzhou	吳 學 周	Physics
Wu Ta-jen	U Da-zhen'		Math
Wu Ta-yu	U Da-yu	吳 大 羽	Physics
Wu Yu-hsun	U Yu-syun'	吳 有 訓	Physics
Yang Chung-chien	Yan Chzhun-tszyan'	楊 鍾 健	Geology
Yao Yui-t'ai	Yao Yuy-tay		Physics

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Wade-Giles Spelling	English Transliteration of Russian Version	Chinese Character Where Known	Field
Yeh Ch'i-sun	E Tsi-sun'	葉企蓀	Physics
Yen Ch'i-ta	Yan' Chzhi-da		Math
Yen Ch'i-tz'u	Yan' Tsi-tsy	嚴濟慈	Physics
Yin Ch'iang-ts'un	In' Tszyan-syun'		Geology
Yu Ch'ien-chang	Yuy Tszyan'-chzhan		Geology
Yu Jui-huang	Yuy Zhuy-Khuan'		Physics

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